

# INVESTIGATOR'S ANNUAL REPORT

## National Park Service

All or some of the information provided may be available to the public

<b>Reporting Year:</b> 2004	<b>Park:</b> Glacier Bay NP & PRES
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<b>Additional investigators or key field assistants (first name, last name, office phone, office email):</b> No co-investigators	
<b>Permit#:</b> GLBA-2004-SCI-0005	
<b>Park-assigned Study Id. #:</b> GLBA-00058	
<b>Project Title:</b> Glacier Bay Oceanographic Patterns	
<b>Permit Start Date:</b> Mar 01, 2004	<b>Permit Expiration Date</b> Dec 31, 2010
<b>Study Start Date:</b> Mar 01, 2004	<b>Study End Date</b> Dec 31, 2010
<b>Study Status:</b> Completed	
<b>Activity Type:</b> Research	
<b>Subject/Discipline:</b> Coastal / Marine Systems	
<b>Objectives:</b> The oceanographic patterns within Glacier Bay drive a large portion of the spatial and temporal variability of the ecosystem. A program that monitors oceanographic patterns is essential to understanding the marine ecosystem and to differentiate between natural variation and anthropogenic disturbance. The objective of this project is to study the spatial and temporal (seasonal and yearly) variation in a number of oceanographic parameters, including salinity, temperature, stratification, light levels, turbidity (sediment load), and chlorophyll-a (productivity).	
<b>Findings and Status:</b> 2004 represented the twelfth year of field sampling for this monitoring program and consisted of four surveys of twenty three stations located throughout Glacier Bay. Sampling during 2004 was conducted during March, June, July and October. These time periods were chosen to represent spring bloom conditions (March), high chlorophyll-a levels (June and July), high stratification and turbidity levels (July), and high precipitation conditions (October). In addition, these months were chosen to give consistency in the timing of sampling among years. At each of the twenty-three stations during each of the sampling times, a vertical profile of salinity, temperature, chlorophyll-a concentration (proxy for phytoplankton abundance), light penetration, and turbidity was taken at one meter intervals from surface waters to bottom depths (or maximum of 300m).  Past oceanographic surveys combined with 2004 sampling in Glacier Bay demonstrate that oceanographic characteristics of the surface waters are relatively similar from November to February, while the periods March through October represent the greatest change, both spatially and temporally (among months). The upper-fjord regions of the Bay, located the farthest from marine waters and closest to glaciers, are the areas of greatest change among months of the year for all measured physical oceanographic factors except water temperature. Noticeable differences in oceanographic properties have been detected between the East and West Arms of the Bay, potentially due to differences in weather patterns between these regions as well as differences in sources of freshwater input and sediment loads. Patterns of salinity and stratification appear to be largely driven by the seasonal cycle of freshwater discharge in southeast Alaska. High levels of freshwater discharge from upper Bay regions promote stratification from spring	

through fall, while strong tidal currents over shallow sills enhance mixing. Elevated levels of chlorophyll-a within the surface waters do not coincide with surface water stratification in May, but instead, an overall increase in chlorophyll-a occurs in March, most likely as a response to an increase in available light. Levels of chlorophyll-a increases from spring to summer and remains relatively high into the fall. Highest levels of chlorophyll-a within Glacier Bay are generally found within the central Bay and the lower reaches of the East and West Arms. These regions are likely favorable for phytoplankton populations due to intermediate stratification levels, higher light penetration due to decreased sediment concentrations in the water column, and nutrient regeneration.

Etherington, Lisa L., Philip N. Hooge, Elizabeth R. Hooge. 2004. Factors affecting seasonal and regional patterns of surface water oceanographic properties within a fjord estuarine system: Glacier Bay, Alaska. U.S. Geological Survey, Anchorage, AK. A final report submitted to National Park Service. 79pp.

Etherington, Lisa L. 2004. Monitoring of oceanographic properties of Glacier Bay, Alaska. 2003 Annual Report. U.S. Geological Survey, Anchorage, AK. An annual report submitted to National Park Service. 37pp.

Etherington, L.L., P.N. Hooge, E.R. Hooge. 2004. Oceanographic patterns in a glacially-fed fjord estuary: Implications for biological productivity and hotspots. American Society of Limnology and Oceanography Annual Meeting, Honolulu, HI. Poster presentation.

Etherington, L.L., P.N. Hooge, E.R. Hooge. 2004. Oceanographic patterns in a glacially-fed fjord estuary: Implications for biological patterns and productivity. Glacier Bay Science Symposium, Juneau, AK. Oral presentation.

**For this study, were one or more specimens collected and removed from the park but not destroyed during analyses?**

No

**Funding provided this reporting year by NPS:**

20000

**Funding provided this reporting year by other sources:**

45000

**Fill out the following ONLY IF the National Park Service supported this project in this reporting year by providing money to a university or college**

**Full name of college or university:**

n/a

**Annual funding provided by NPS to university or college this reporting year:**

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